THAT CLAIMED IS

1. A power generation system to compensate for different power system output frequencies, the system comprising:

a turbine having a turbine rotor positioned to rotate at a preselected rotational frequency;

a generator positioned to generate a power system output current at a preselected power system frequency, the generator having a generator stator and a generator rotor positioned within the generator stator to induce electromotive force to the generator stator, the generator rotor being coupled to the turbine rotor to be driven by the turbine rotor at substantially the same preselected rotational frequency, the generator rotor including a rotor body and a plurality of generator coils mounted to the rotor body to induce electromotive force to the generator stator during rotation; and

a frequency differentiator coupled to the generator rotor and connected to the power system electrical current output to differentiate between the preselected power system output frequency and the preselected rotational frequency of the generator rotor so that variations in the preselected power system frequency appear as variations in the generator rotor alternating electrical current frequency to thereby compensate for different preselected power system output frequencies.

2. A power generation system as defined in Claim 1, wherein the frequency differentiator comprises an exciter having an exciter rotor coupled to the generator rotor to provide magnitomotive force to the generator rotor at the same preselected rotational frequency, the exciter rotor having a rotating armature including at least one coil

positioned thereon, and an alternating current regulator positioned to receive unregulated electrical current from the power system electrical output current at the preselected power system output frequency and positioned to supply a regulated alternating current to the at least one coil of the rotating armature of the exciter so that the electrical frequency of the at least one coil of the rotating armature substantially equals a difference between the preselected power system output frequency and the preselected rotational frequency.

3. A power generation system as defined in Claim 2, wherein a portion of the power system electrical current output of the power generation system is transferred to the generator rotor from the at least one coil of the rotating armature of the exciter and then to the generator stator.

4. A power generation system as defined in Claim 3, wherein the portion of the power system electrical current output is about 5 to about 20 percent of the power system electrical current output of the power generation system.

5. A power generation system as defined in Claim 2, wherein the exciter rotating armature includes a plurality of exciter alternating current coils to thereby provide a plurality of alternating current phases, and wherein the exciter is excited at the preselected power system output frequency.

6. A power generation system as defined in Claim 1, wherein the preselected rotational frequency of the generator rotor and the turbine rotor is about 55 Hertz,

wherein the generator rotor includes a rotor shaft, wherein the turbine rotor includes a turbine shaft, and wherein the generator rotor is coupled to the turbine rotor by coupling the rotor shaft to the turbine shaft.

7. A power generation system as defined in Claim 6, wherein the preselected power system output frequency is either about 60 Hertz or about 50 Hertz.

8. A power generation system as defined in Claim 7, wherein the generator rotor body includes a plurality of rotor body lamination layers to thereby define a laminated rotor, each of the plurality of rotor body lamination layers being positioned adjacent another one of the plurality of rotor body lamination layers in a stacked relationship in a plane extending tranverse to a longitudinal axis of the generator rotor shaft.

9. A power generation system to compensate for different power system output frequencies, the system comprising:

a turbine having a turbine rotor positioned to rotate at a preselected rotational frequency;

a generator positioned to generate a power system output current at a preselected power system frequency, the generator having a generator stator and a generator rotor positioned within the generator stator to induce electromotive force to the generator stator, the generator rotor being coupled to the turbine rotor to be driven by the turbine rotor at substantially the same preselected rotational frequency, the generator rotor including a rotor body and a plurality of generator coils mounted to

the rotor body to induce electromotive force to the generator stator during rotation;

an exciter having an exciter rotor coupled to the generator rotor to provide magnitomotive force to the generator rotor at the same preselected rotational frequency, the exciter rotor having a rotating armature including at least one coil positioned thereon; and

an alternating current regulator positioned to receive unregulated electrical current from the power system electrical output current at the preselected power system output frequency and positioned to supply a regulated alternating current to the at least one coil of the rotating armature of the exciter so that the electrical frequency of the at least one coil of the rotating armature substantially equals a difference between the preselected power system output frequency and the preselected rotational frequency.

10. A power generation system as defined in Claim 9, wherein a portion of the power system electrical current output of the power generation system is transferred to the generator rotor from the at least one coil of the rotating armature of the exciter and then to the generator stator.

11. A power generation system as defined in Claim 10, wherein the portion of the power system electrical current output is about 5 to about 20 percent of the power system electrical current output of the power generation system.

12. A power generation system as defined in Claim 10, wherein the exciter rotating armature includes a

plurality of exciter alternating current coils to thereby provide a plurality of alternating current phases, and wherein the exciter is excited at the preselected power system output frequency.

13. A power generation system as defined in Claim 12, wherein the preselected rotational frequency of the generator rotor and the turbine rotor is about 55 Hertz, wherein the generator rotor includes a rotor shaft, wherein the turbine rotor includes a turbine shaft, and wherein the generator rotor is coupled to the turbine rotor by coupling the rotor shaft to the turbine shaft.

14. A power generation system as defined in Claim 13, wherein the preselected power system output frequency is either about 60 Hertz or about 50 Hertz.

15. A power generation system as defined in Claim 14, wherein the generator rotor body includes a plurality of rotor body lamination layers to thereby define a laminated rotor, each of the plurality of rotor body lamination layers being positioned adjacent another one of the plurality of rotor body lamination layers in a stacked relationship in a plane extending tranverse to a longitudinal axis of the generator rotor shaft.

16. A method of compensating for different power system output frequencies in a power generation system, the method comprising:

selecting a desired power system output frequency for a power generation system;

selecting a desired rotational frequency of a generator rotor of a generator of the power generation system; and

differentiating between the selected power system output frequency and the selected rotational frequency of the generator rotor so that variations in the preselected power system output frequency appear as variations in generator rotor alternating electrical current frequency to thereby compensate for different preselected power system output frequencies.

17. A method as defined in Claim 16, wherein the power generation system includes an exciter coupled to the generator rotor and rotating at the same selected rotational frequency, and wherein the step of differentiating includes regulating alternating current received from power system alternating current output and supplying the regulated alternating current to the exciter.

18. A method as defined in Claim 17, wherein the exciter includes a rotating armature having at least one coil, and wherein the electrical frequency of the at least one coil of the rotating armature substantially equals a difference between the selected power system output frequency and the selected rotational frequency.

19. A method as defined in Claim 17, wherein the generator further includes a generator stator positioned to receive induced electromotive force from the generator rotor during rotation, and wherein a portion of the power system electrical current output of the power generation

system is transferred to the generator stator from the generator rotor.

20. A method as defined in Claim 19, wherein the selected rotational frequency of the generator rotor is about 55 Hertz, and wherein the selected power system output frequency is either about 60 Hertz or about 50 Hertz.